pulverizer for reducing the size of the particles. The apparatus includes a mechanism for separating undesired material from desired material.

IN THE SPECIFICATION:

Page 17, lines 9-26:

The grinding chamber **200** inside of the pulverizer is shown in more detail in Figure **2**. In the figure, **201** is a heavy stationary grinding ring. **202** is a rotating roller. The roller is suspended from a rotating crossbar **204** cantilevered from a vertical centered drive shaft **205**. Particles are pulverized by compression between the grinding ring **201** and the rotating rollers **202**. One roller, **202**, is shown in Figure **2**. Mills may employ several rollers. A rotating plow, **206**, cantilevered from the center shaft, throws the large, heavy particles which land near the center of the mill base back into the grinding zone between ring and rollers. Particles which are difficult to grind and which are too heavy to be lifted by the air flow, **5**, entering the mill base through air flow casing **18** and passing through a plurality of vanes **208** concentrate in the base of the pulverizer **207**. Removal mechanism **7** passes through the air scroll casing **18**. It opens to the base of the mill inside one the air flow vanes **208**. A second removal mechanism **8** enters the grinding chamber at **209** above the elevation of the rotating cross bar **204**.

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Hot air **5** is blown into the base of the mill **207** through the air casing **18** shown in Figure **3.** Temperatures up to 250 to 350 degrees Fahrenheit can be used. The air is heated upstream of the air scroll casing by means not shown. The air enters the base of the mill with velocities ranging upward to several thousand feet per minute. The air swirls around the casing and enters the mill through vanes **208** opening underneath the grinding ring **201**. The vanes direct the air flow tangential to the inside diameter of the grinding chamber **200**. Removal mechanism **7** opens to the mill base in the grinding chamber through vane at **208.** It is a screw conveyor of the type manufactured by AFC of Clifton, NJ. The separation mechanism may be located in any air inlet vane around the circumference of the pulverizer but preferentially is located away from the pulverizer inlet **4**. The screw conveyor opens just inside the vane without protruding into the base where it would be hit by the plow. The air flow slot **301** immediately upstream of the screw conveyor opening is plugged off to prevent air flow. In operation, this permits buildup of particles in front of the screw conveyor. It is not necessary to employ an air lock device at the exit of the conveyor because air flow is blocked by particles inside the length of the conveyor. The screw conveyor mechanism must be able to operate at the temperature in the base of the pulverizer. More than one removal mechanism **7** may be used in the base of the mill.

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The inside of the pulverizer at an elevation above the top of the gear train mechanism **211** is shown in Figure **4**. The casing **400** encloses the inverted cone of a static classifier **401**. Air and particles passing upward through the mill enter the classifier through vanes **402**. Small particles and air exit the pulverizer through the product pipe at **6**. Oversize particles drop to the bottom of the inverted cone and return to the grinding chamber **200** through flap valves **403**. A removal mechanism **9** is attached to the outside wall of the casing **400**. It connects to the inside space between the casing wall and the inverted cone **401**. A removal mechanism **10** passes through the casing **400** and is attached to the bottom of the inverted cone at the flap valves **403**.

Removal mechanism **8** is a kick-out door. It opens to the inside of the pulverizer chamber at **209**. The removal mechanism **8** can be located at any elevation from the top of the roller **202** up to the top of the grinding chamber at **210.** It is preferentially at an elevation above or below the rotating arm **204** and at a location around the circumference of the grinding chamber which is away from the feed **4** and the mill drive shaft **212**. More than one removal mechanism **8** may be used in the grinding chamber.

Removal mechanism **9** is a kick-out door. It opens into the region of the pulverizer above the top of the gear train mechanism **211** between the casing **400** and the inverted cone **401** of the classifier**.** It can be located at any elevation from the top of the gear train mechanism **211** up to an elevation below the entrance to the classifier at **402**. More than

one removal mechanism **9** may be used above the top of the gear train mechanism. It can be located anywhere around the circumference of the classifier.

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The kick-out door mechanism can be as shown in Figure **6** or Figure **7**. The mechanism **700** shown in Figure **7** is attached to the pulverizer through mill flange **701**. The kick-out door **702** is hinged horizontally so that it opens into the volume of the pulverizer from the bottom edge of the chute **703**. Particles which are falling downward inside the pulverizer would be deflected into the chute **703** as shown. Lever **704** is used to open or close the kick-out door **701**. The chute **703** is attached to air lock mechanism **612** through air-lock flange **611**. The air lock of the type manufactured by W. M. Meyer & Sons, Skokie, IL, can be operated manually or continuously. The kick-out door mechanism can be hinged horizontally so as to open horizontally from the top or the bottom of the chute or it can be hinged vertically from the left or the right side of the chute so as to open clockwise or counterclockwise as seen from above.

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Page 21, line 24 through page 22, line 11:

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Particles removed from the pulverizer by removal devices **7, 8, 9, or 10** can be issued to reject stream **17** directly or conveyed **11** to feed hopper **20.** The particles withdrawn

from the internal circulation in the mill by any of the removal mechanisms **7, 8, 9,** or **10** can be directed individually or in combinations to the reject stream **17**. The conveyance mechanism **11** can be a screw conveyor or a conventional conveyor of the type manufactured by AFC of Clifton, NJ. The conveyance mechanism **11** and the separation mechanism **2** and return conveyance mechanism **16** and the reject conveyance mechanism **17** should be enclosed to prevent dusting. The capacity of the conveyors **11** ranges from 1/10 to the full rate at which particles are fed to the pulverizer and preferentially is in the range of 1/3 to ½ of the full rate of the feed. The capacity of the return conveyance devices **16** and the reject conveyance mechanism **17** ranges from 1/6 to the full rate of the feed to the pulverizer.

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Page 43, line 7 through page 44, line 13:

Particles colliding with or moving near the walls of the grinding chamber **200** are removed from the pulverizer through removal mechanism **8** mounted on the wall of the grinding chamber. There may be more than one such separation mechanism and they may be mounted at various elevations above the top of the grinding zone in the base of the mill **207**. The removal mechanism **8** opens into the mill through a hinged door which can be directed to catch particles which are rising, falling, or moving around the circumference of the mill in either clockwise or counterclockwise direction. An air-jet mechanism **615** can be used to prevent excess amount of fine material from being withdrawn from the mill. This is accomplished by directing the air jet into the mill through the opening for mechanism **8**. The

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coarse particles which are deflected into the separation mechanism fall through an airlock mechanism which serves to isolate the atmosphere inside the mill. The mill can be of the overpressure or the under-pressure type. Particles exiting mechanism **8** can be discharged to the reject stream **17** directly when the quality of the particles does not warrant processing with separation mechanism **2** or conveyed to the separation mechanism **2** via conveyor **11**. This conveyor can be a screw conveyor, a belt conveyor, elevator or any method for moving the particles in the minus 8 mesh size fraction.

Particles which are falling along the inside wall of the outside casing of the classifier are removed from the pulverizer circulation by removal mechanism **9**. More than one such mechanism may be employed and they may be mounted at any elevation below the entrance to the classifier at the top of the mill. This mechanism may be arranged to catch particles rising, falling, or with a vortex motion in either direction around the inside wall of the classifier casing. Preferentially, it is arranged to catch particles falling back to the grinding zone. An air jet mechanism **615** similar to that described above can be used to prevent an excess of small particles from exiting the mill. The mechanism and the means to convey to the separation mechanism **2** or to the reject stream **2** are similar to that of separation mechanism **8**.